

Application No. 10/631,927
Amendment dated June 21, 2005
Reply to Final Office Action of March 24, 2005

Docket No. F232-5091

REMARKS

Applicant respectfully requests reconsideration of this application in view of the foregoing amendment and following remarks.

Status of the Claims

Claims 21-32 are pending in this application. Claim 21 is independent. All of the pending claims stand rejected. By this amendment, independent claim 21 is amended. No new matter has been added by this amendment.

Rejections under 35 U.S.C. §102

Claims 21-23, 25-28 and 32 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,813,233 to Okuda et al. ("Okuda").

The Examiner indicated that Fig. 20 of Okuda teaches a cooling system having a radiational member (41, 42) spaced apart from a rear surface of a cooled optical element (39). The Examiner also cites col. 17, line 40 - col. 18, line 15 of Okuda as disclosing a control method of the reference temperature of the optical element.

Applicant respectfully disagrees with the Examiner's rejections for at least the reasons as set forth below.

First of all, the present invention requires that the optical element is cooled at a vacuum atmosphere. A portion of the original specification states that the optical element M is provided in a vacuum chamber VC that is maintained to be a high vacuum such as 1×10^{-6} [Pa]. See, for example, the first full paragraph of page 19 of the original specification.

In contrast, Okuda discloses a thermoelectric cooling system of a liquid crystal projector in which a cooled air 38 is introduced into the optical element arrangement as shown in Fig. 20.

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Fig. 20 of Okuda discloses that a cooling fan 38 introduces the cooled air into the optical element arrangement. See, also, col. 15, lines 13-21 of Okuda. In other words, Okuda's cooling system is NOT a vacuum atmosphere as specifically recited in claim 21 of the present application.

By cooling the optical element in a vacuum atmosphere, the present invention eliminates the reaction between the residual gas component in the exposure optical path and the EUV light may not contaminate the surface of the optical element (e.g., a mirror) which usually causes the degradation of the reflectance of the optical element. See, for example, lines 11-18 of page 10 of the original specification.

Secondly, claim 21 of the present application specifically recites that "said heat transfer system keeping temperature of the coolant substantially the same as a reference temperature of the optical system." Referring to Fig. 3 of the original specification, a coolant is circulated through the channel 252 of the circulation part connected to the cooling pipe 222A. As a result, it is unnecessary to make the temperature of the coolant variable or remarkably low in the present invention. For example, the coolant may have the temperature of 23 °C in attempting the temperature of the optical element at 23 °C. See, for example, lines 7-21 of page 24 of the original specification.

In contrast, there is no specific teaching in Okuda that teaches the temperature of the coolant. Okuda merely teaches that the temperature is adjusted by turning "ON" or "OFF" the cooling fan 34 and the Peltier element 32 based on experiments. See, for example, col. 15, line 40 - col. 18, line 15 of Okuda.

Accordingly, claim 21 is believed neither anticipated by nor rendered obvious in view of Okuda for at least the reasons discussed above.

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Nonetheless, claim 21 has been amended for further clarification. In particular, amended claim 21 recites among other things "a radiational member, arranged apart from the optical element, to receive heat from the optical element by radiational heat transfer; a Peltier element contacted to said radiational member with a heat absorption surface to cool said radiational member; a control system configured to control temperature of said radiational member by controlling temperature of said Peltier element; and a heat transfer system contacted to a heat radiation surface of said Peltier element to flow a coolant via a circulation channel thereby transferring heat from said Peltier element, wherein said heat transfer system maintains temperature of the coolant substantially the same as a predetermined temperature of the optical system."

Applicant believes that amended claim 21 further distinguishes and is patentable over Okuda for at least the similar reasons discussed above.

Reconsideration and withdrawal of the rejection of claim 21 under 35 U.S.C. §102(b) is respectfully requested.

Applicant has not individually addressed the rejections of the dependent claims because Applicant submits that the independent claims from which they respectively depend are in condition for allowance as set forth above. Applicant however reserves the right to address such rejections of the dependent claims should such be necessary.

Applicant believes that the application as amended is in condition for allowance and such action is respectfully requested.

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AUTHORIZATION

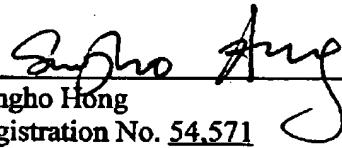
No petitions or additional fees are believed due for this amendment and/or any accompanying submissions. However, to the extent that any additional fees and/or petition is required, including a petition for extension of time, Applicant hereby petitions the Commissioner to grant such petition, and hereby authorizes the Commissioner to charge any additional fees, including any fees which may be required for such petition, or credit any overpayment to Deposit Account No. 13-4500 (Order No. 1232-5091). A DUPLICATE COPY OF THIS SHEET IS ENCLOSED.

An early and favorable examination on the merits is respectfully requested.

Respectfully submitted,
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Dated: June 21, 2005

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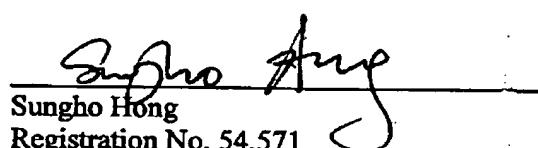
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